

## Predicting the Poverty Impacts of Trade Reform

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*Notes:* Reimer's 2002 Working paper (written nearly three years ago) sought to collect and categorize all of the existing studies aimed at estimating the poverty impacts of trade reform. The two lasting contributions of this paper are: (1) the broad classification of studies into different categories, and (2) the exhaustive tabulation of these studies and their detailed characteristics in Tables 1-4.

This paper offers a critical survey of this literature. It covers more recent work and provides an in-depth analysis on each of the topics and offer a critical analysis of what has been done, as well as suggestions for future research. This paper forms the basis for a major Bank-Netherlands Partnership Program project on trade and poverty.

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## **Predicting the Poverty Impacts of Trade Reform**

### **Abstract**

An important area of research in recent years involves assessing the micro-economic implications of macro-level policies – particularly those related to international trade. While a wide range of research methodologies are available for assessing the micro-economic incidence of micro-policies, as well as for assessing the impact of macro-level policies on markets and broad groups households, there is a gap when it comes to eliciting the disaggregated household and firm level impacts of trade policies. Recent research addresses this knowledge gap and the present survey offers an overview of this literature.

The preponderance of the evidence from the studies encompassed by this survey points to the dominance of earnings-side impacts over consumption side effects of trade reform. This is problematic, since household surveys are notable for their under-reporting of income. From the perspective of the poor, it is the market for unskilled labor that is most important. The poverty impacts of trade policy often hinge crucially on how well the increased demand for labor in one part of the economy is transmitted to the rest of the economy via increased wages, increased employment or both. Further econometric research aimed at discriminating between competing factor mobility hypotheses is urgently needed.

## **Predicting the Poverty Impacts of Trade Liberalization: A Survey**

### **I. Introduction and Motivation**

International trade is arguably the most direct economic means by which rich countries influence poor countries. Exports of manufactures by developing countries have increased rapidly over the last 30 years, due in part to falling tariffs in OECD as well as developing countries, declining transport costs, increased specialization, and sustained economic growth. This has benefited many developing countries, helping them make the transition out of agriculture, and lifting many out of poverty (Hertel and Martin, 2000). However, the poorest developing countries have gained relatively less from increased manufactures trade. Potential exports of labor intensive products such as wearing apparel are hampered by long-standing rich country protection. Furthermore, farming remains a key source of employment and exports in many of the poorest countries, yet OECD protection of this sector remains very high. The problem is exacerbated by massive subsidies provided to OECD farmers by their governments.

Examination of the distribution of poverty in the poorest countries underscores why these developed-country policies are so influential. A majority of the poor are concentrated in rural areas, where agriculture is often the main source of economic activity (World Bank Development Prospects Group, 2004). Furthermore, in the poorest developing countries, a large share of the households depend on self-employment in agriculture for virtually all of their income, and these agriculture-dependent households are often amongst the poorest in the entire country (Hertel et al., 2004b).

The Doha negotiations, sponsored by the World Trade Organization, experienced a severe blow in Cancun, Mexico, precisely over the question of rich country agricultural support and the potential impacts on poverty in developing countries. The WTO negotiations are now emphasizing the need to better understand the linkages between trade policies – particularly in rich countries – and poverty in the developing world. As well, poverty reduction has become a central focus of development efforts at the World Bank and other development institutions. For example, under the “Millennium Development Goals” the international community has committed to halve poverty by 2015, and several key targets relate to international trade.

Poverty impacts of trade policy are also increasingly arising in the national policy debate. Concerns about urban poverty during the Asian financial crisis caused the government of Thailand to consider introducing an export tax on rice (Warr, 2001), while recent concern for the rural poor in Indonesia precipitated the introduction of an import tariff on rice in that country in 2000, followed by temporary rice import bans in 2004. China's recent debate over WTO accession – largely a unilateral trade policy reform – was also permeated by a concern for the potential adverse impacts on rural poverty in a country exhibiting historic levels of rural-urban inequality (Bhattasali, Li and Martin, 2004). More generally, the World Bank is now mandated to conduct trade diagnostic studies for all least developed countries, and these studies have an explicit goal of assessing the poverty impacts of prospective trade reforms.

Without an analytical framework it is hard to evaluate the impacts of trade policies on the poor. For example, in the case of the proposed Thai export tax, Warr (2001) finds that the intended beneficiary, namely the urban poor, would have been hurt by this policy proposal, due to the adverse effect on unskilled wages – an unanticipated by-product of the proposed policy. To place future debates on a firmer economic foundation, new policy modeling frameworks are needed to evaluate the claims of special-interest groups, and identify policy packages that promote poverty reduction (Harrison, Rutherford and Tarr, 2003).

With this high level of policy interest, it is hardly surprising that the issue of trade and developing-country poverty has become a focus of much research activity over the last several years. This paper offers a survey of recent studies that analyze how trade policies – both in developed and developing countries – affect the incidence of poverty in the latter. The objective is to summarize the approaches and insights offered by the diverse strands of research that are currently being conducted. While a number of the most important findings are reviewed, it must be said at the outset that the field is undergoing rapid evolution and has yet to reach a consensus on many key issues.

Not surprisingly, a variety of methodologies have been proposed to analyze the various trade/poverty linkages, which suggests that the range of findings will also be diverse. The most obvious methodological gulf is between researchers who come at these issues from a tradition of measuring poverty using detailed household expenditure data, and those who are of a trade background and more accustomed to dealing with economy-wide, national accounts data. One might

refer to these as “bottom-up” and “top-down” approaches, respectively. The former emphasizes the heterogeneity of individuals and households as revealed through surveys, while the latter frequently employs the microeconomic assumption of a representative agent and focuses on relative price effects and getting the macro-economic aggregates right.

Another methodological gulf is between research that emphasizes direct measurement of economic phenomena (e.g., Deaton 2003), and research that seeks to make broad inferences by placing more structure on the problem (e.g., applied general equilibrium models). As modelers incorporate more trade/poverty linkages into their analysis, more assumptions must also be made, and it can be hard to distinguish those results that are driven by data, from those that are a consequence of specific modeling assumptions. However, adding more structure is often necessary to tackle the issues of fundamental interest to policy-makers, and such studies are increasingly less speculative due to increasing emphasis on parameter estimation and model validation (e.g., Hertel, Reimer, and Valenzuela, 2004).

Despite this apparent diversity in methods, there appears to be increasing recognition that any analysis of trade, trade policy, and poverty needs to come to grips with the issue of factor market effects – in particular the impacts of trade on employment and earnings. This was one of the key conclusions of the October 2000 *Conference on Poverty and the International Economy*, organized by the Swedish Parliamentary Commission on Global Development and the World Bank. Those studies that focused exclusively on consumption impacts (e.g., Case, 2000; Levinsohn, Berry and Friedman, 2000) were found to be missing a large part of the impacts on the poor. Unfortunately, those studies seeking to address the employment and earnings impacts also had serious limitations (Cranfield, Hertel and Preckel, 2000; Harrison, Rutherford and Tarr, 2000) and it was left to subsequent efforts to improve this aspect of the analysis. More recent empirical studies that make contributions in this area include Bourguignon, Robilliard and Robinson (2003); Harrison, Rutherford, Tarr, and Gurgel, (2003); Hertel, Ivanic, Preckel, and Cranfield (2004); and Warr (2001). The overriding importance of factor market effects is due to the fact that households tend to be much more specialized with regard to income sources than they are with regard to consumption. Accordingly, this survey places particular emphasis on how current analyses address the factor income side of the trade/poverty issue.

To keep the survey manageable, and to avoid undue repetition of what has already been covered in other surveys, a set of criteria for inclusion is adopted. First of all, papers from the extensive literature on trade and wages are excluded since they are typically concerned with labor market and income distribution issues in *developed* instead of *developing* countries. Moreover, a number of excellent overview studies on that topic already exist, including Wood (1995) and Slaughter (1999). Within the realm of trade/poverty studies, this survey places emphasis on studies that involve some sort of “counterfactual” analysis, as opposed to those emphasizing how poverty has evolved over time (e.g., Chen and Ravallion, 2004). Counterfactual analysis is stressed because it facilitates understanding the links between a specific shock and poverty, holding all other factors constant. An alternative approach to surveying the literature is to identify the main economic mechanisms linking trade policy and poverty, and to review the empirical evidence on each of these components. This is the approach taken by Winters, McCulloch, and McKay (2004) in their recent survey.

While all the studies in this survey focus on the poor in developing countries, they do not all involve a change in trade policy. For example, a few papers on technical change, economic growth, and macro-economic shocks are included because their frameworks, and the associated insights, are readily transferable to trade policy analysis. Additionally, this survey places emphasis on studies that have an empirical rather than theoretical focus, and have been carried out within the last 10 years or so. Indeed, most of the papers surveyed are not yet published.

The reader should note that the survey is not exhaustive, and that our strategy is not to give a summary of *every* paper that fits our stated criteria, but to examine a few representative studies in each of several categories. The point is to highlight the trade/poverty linkages that are being considered, insights obtained, the advantages and drawbacks of particular approaches, and lessons for future work.<sup>1</sup> We do not judge papers against a common standard, since each has a unique purpose, domain of application, and corresponding set of specific limitations and qualifications.

In collecting studies to include in this survey, it quickly became apparent that there is no obvious or ideal means to categorize them, since – as alluded to above – they differ in a number of

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<sup>1</sup>Readers interested in a “tool kit” for conducting trade/poverty simulations are referred to the excellent synthesis provided by Bourguignon and Pereira da Silva (2003).

significant ways. Studies vary across many dimensions, such as whether the analysis is carried out for representative households or actual households (i.e. micro-simulation), whether it is static or dynamic, single- or multi-region, partial- or general-equilibrium, and so forth.

Out of these possibilities, four broad categories of study are identified based upon the principal methodology employed. These categories are loosely defined and unlikely to satisfy every reader, but they provide a starting point for getting a grip on what is an extraordinarily wide range of approaches. The first category encompasses a broad array of *partial-equilibrium* and/or *cost-of-living* approaches. These studies are typically based on household expenditure data, and generally emphasize commodity markets and their role in determining poverty impacts, or at least as a measure of poverty across time. Factor earnings are frequently ignored.

In contrast, studies in the second category all involve some form of *general equilibrium* model that accounts for commodity, terms of trade, and factor market effects. These studies are usually based on disaggregated economy-wide Social Accounting Matrices for individual countries.<sup>2</sup> They are also closely related to the third category of study, which represents a relatively recent approach – general equilibrium simulation coupled with incidence analysis based on household survey data. These studies may be thought of as involving a *micro-macro synthesis*. While the term “micro-macro” has been used differently in other contexts, in this paper it is meant to refer to the linking of a model based on household survey (micro) data with a model based primarily on macro-level data.

The fourth category of study attempts to estimate the long run potential for poverty reduction through the effect of trade liberalization on economic growth. This is typically undertaken in a series of steps, whereby the effect of trade liberalization on capital accumulation, productivity and economic growth is first estimated, thereupon using some sort of reduced form relationship to estimate the poverty reduction that might occur as a result of this growth. Whereas the first three sets of studies tend to focus on changes in income distribution, this group abstracts from such changes, focusing instead on shifts in the aggregate income distribution.

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<sup>2</sup> Cloutier, Cockburn, and Decaluwé (2004) provide an extensive review of CGE models used in this field.

## II. Trade-Poverty Linkages

Before exploring the various methodological approaches and associated findings, it is useful to consider the economic linkages that may exist between trade, trade policy, and poverty. In a comprehensive paper on this topic, Winters (2000) identifies several key linkages, which are reiterated in large part by Bannister and Thugge (2001). Potential links include changes in:

- (a) the price and availability of goods;
- (b) factor prices, income, and employment;
- (c) government taxes and transfers influenced by changes in revenue from trade taxes;
- (d) the incentives for investment and innovation, which affect long-run economic growth;
- (e) external shocks, in particular, changes in the terms of trade;
- (f) short-run risk and adjustment costs.

Most studies focus on only one or two of these linkages, while abstracting from the rest. Nearly all of the studies in this survey consider the consumption side of the trade-poverty linkage (a). This is particularly important, given the prevalence of food in the poorest households' budgets (often as much as 70% of household spending) and the highly distorted nature of world food trade. Coverage of linkages (b) through (f) is more uneven. For example, a study by Levin (2000) focuses on transfers, link (c). Several of the studies emphasize long-run growth as the primary vehicle for poverty reduction (Cline, 2004; Dollar and Kraay, 2002; World Bank, 2004). Of course, a full exploration of the linkages between trade and economic growth would require a survey in its own right, so we restrict ourselves to work that has focused on the poverty dimension of the trade/growth linkage. Most of the economy-wide analyses account for terms of trade effects, link (e). Each study typically abstracts from at least two of the linkages in order to keep the model tractable, and because the necessary data may not have been available. When reading a paper one should keep in mind which linkages are excluded from the analysis, and how this may influence the results.

As suggested in the introduction, the factor price, income, and employment link (b) will be featured front-and-center in this survey. Perhaps most obviously, if an external shock to the economy leads to the loss of employment in the high wage, formal sector of the economy for a primary wage earner, a household that was formerly well-above the poverty line could fall into poverty overnight (Bourguignon, Robilliard, and Robinson, 2003). Even if they retain their job, low-income household



welfare is generally quite sensitive to changes in unskilled wages and returns to self-employment. As previously noted, there are many households in developing countries that are highly specialized in their earnings patterns (e.g., virtually all of their income is derived from farming). In other words, two households may have identical commodity budget shares, and the same level of income, but entirely different *sources* of income; e.g., one derives all income from agricultural self-employment, while the other relies on transfers from a relative who works abroad. This point is reinforced in the recent study of prospective trade reforms in Morocco by Ravallion and Lokshin (2004). They usefully distinguish *vertical inequality* (differential impacts on households at different income levels) from *horizontal inequality* (differential impacts on households at the same initial income level). They find that the horizontal impacts are dominant in their analysis – largely due to differences in income sources of these diverse households.

Within the world of classical trade theory, factor earnings effects are key to the famous Stolper-Samuelson theorem (1941), which relates international trade to the domestic distribution of income. By the Heckscher-Ohlin theorem, a country has a comparative advantage in the good that intensively uses the country's relatively abundant factor. Free trade will increase the relative price of that good and so, by the Stolper-Samuelson theorem, increase the real return of the relatively abundant factor by an even *larger* percentage. As a result, it can be said that changes in commodity prices due to trade liberalization tend to *magnify* the resulting changes in factor prices (Jones, 1965). The extent to which commodity price changes are magnified in factor prices is even greater in the short run when some factors are sector-specific. The presence of this magnification effect in theoretical trade models is one reason why trade economists tend to focus on factor market effects when analyzing trade liberalization and poverty.

Three empirical studies quantify the importance of this theoretical insight. A general equilibrium analysis of technical change in the Philippines by Coxhead and Warr (1995) finds earnings effects to be substantially more important than consumption effects. In particular, income effects accounted for two-thirds of poverty alleviation when there is a rise in agricultural productivity. While this is not a trade liberalization study, the nature of the shock is not dissimilar since the adjustments are transmitted through commodity and factor markets. Harrison, Rutherford, and Tarr (2000) find that factor price changes drive the incidence of trade liberalization in Turkey. They

demonstrate this by employing three restricted simulations in which the 40 representative households in the analysis (differentiated by rural/urban orientation and by income level) have (i) identical consumption shares, (ii) identical factor income shares, and then (iii) identical consumption *and* factor income shares. Since the results from simulation (i) are nearly identical to those generated when the heterogeneity of the 40 households is left intact, the authors conclude that “clearly, for the poor it is the source of income, not the pattern of expenditure that is driving the adverse impact relative to the average household” (p. 107).

The general equilibrium analysis of rice export taxation in Thailand by Warr (2001) also suggests that factor earnings effects are the driving force behind welfare and distributional effects. Although an export tax generates government revenue and lowers the price of rice for consumers, it also lowers the return to unskilled labor, which is used intensively in the Thai rice industry. Because both the rural and urban poor derive more than 40% of their income from unskilled labor (according to the Thai survey upon which the stylized households are based), the negative income effect ends up *outweighing* the consumption benefit, such that both the rural *and* urban poor are harmed by the export tax in Warr’s analysis.

Despite the apparent importance of factor earnings effects, until recently they have generally not been accounted for in studies that quantify the effects of external shocks on the poor in developing countries. As will be seen in the next section, this is particularly the case historically for analyses based on detailed household surveys.

### **III. Partial Equilibrium Analysis**

The simplest, and most logical, place to begin our survey of previous work is with studies that focus on the impact of the commodity price changes flowing from trade liberalization (point (a) in Winters’ list). This takes us into the realm of partial-equilibrium/cost-of-living analysis. While this characterization is quite broad and somewhat awkward, these studies are all “partial equilibrium” in nature, since they focus on one or a limited number of markets in an economy. Additionally, most can be considered “cost-of-living” studies since they tend to focus on the impact of commodity price changes on household expenditure and hence on poverty. The majority of studies in this category can also be regarded as micro-simulation models. Micro-simulation is distinguished by a focus on

incidence and behavior at the individual or household level, as opposed to using a *representative* household to capture the behavior of an aggregate grouping of households.

A great many papers fit into the partial-equilibrium/cost-of-living analysis category.<sup>3</sup> One example is Levinsohn, Berry and Friedman (2000), who examine how the 1997-1998 Indonesian economic crisis affected poor households in that country. Although their study does not involve trade liberalization, the approach can be used for such a purpose, and it serves to highlight the general methodology of many studies within this category. The authors combine 1993 consumption data for 58,100 households from the Susenas survey, along with price changes contemporary with the crisis, to compute household-specific cost-of-living changes. The salient finding is that very-low-income households were not insulated from the international shocks, and in fact tended to be hurt the most. Regardless of urban or rural orientation, households at lower expenditure levels experienced larger cost-of-living increases. Additionally, the consumer price impacts of the crisis were greater for urban than rural areas, and greatest overall for the urban poor.<sup>4</sup>

The beauty of the Levinsohn, Berry and Friedman analysis is its simplicity and high level of household disaggregation. However, from a methodological perspective, this work has several drawbacks. Firstly, the analysis does not isolate the financial crisis from other phenomena, including the El Nino drought and widespread forest fires occurring in the same period. To do so would require a more complete model of macro-economic activity, such as that offered by Robilliard, Bourguignon, and Robinson (discussed in the micro-macro synthesis section) who provide an alternative assessment of the Indonesian crisis that provides such a decomposition.

A second methodological limitation of the Levinsohn, Berry and Friedman (2000) study is that it abstracts from changes in the households' pattern of consumption in the wake of the financial crisis. In terms of a household's demand schedule for a given good, there are no movements along or shifts

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<sup>3</sup> A few of the studies in this general category are: Deaton (1989); Ravallion (1990); Ravallion and van de Walle (1991); Levinsohn, Berry, and Friedman (2000); Case (2000); Deaton (2003); Minot and Goletti (2000); Dercon (2001); McCulloch and Calandrino (2001); Fofack, Monga, and Tuluy (2001). Summaries are provided in the tables of Reimer (2002).

<sup>4</sup> This finding is reinforced by the study of Suryahadi et al. (2000) who estimate that the poverty headcount in Indonesia rose by 152% in urban areas, vs. just 57% in rural areas, during the 1996-99 period.

in the demand curve. Therefore, Indonesian households may not have fared as badly as the paper might suggest. Friedman and Levinsohn (2002) seek to remedy this limitation by estimating a set of own- and cross-price elasticities of demand and utilizing these to refine their welfare predictions. They find that inclusion of these substitution effects cuts the welfare losses in half. While the authors express some reservations about the quality of their estimated elasticities, this difference shows that it is potentially quite important to incorporate households' behavioral responses to large external shocks.

The third, and most serious limitation of the Levinsohn et al. work is the fact that it focuses exclusively on the consumption side of the crisis (link (a) in section II), thereby precluding calculation of its *real income* effects. Yet the households' factor earnings responses to the Indonesian crisis were also quite dramatic. Smith et al. (2002) offer a comprehensive analysis of changes in employment, wages and family incomes during the 1996–1998 period, with a special focus on households' responses to the crisis of 1997/98. They find that, while real wages were sharply reduced during the crisis – by as much as 60% in the case of formal sector employment in rural areas -- combined family income in these rural areas fell by only about 37% during the crisis. They attribute this dampening effect to the relatively stable returns to self-employment activities (primarily agriculture) and the increased allocation of family labor to self-employment. When the value of production for home use is also included in the calculations, the authors find that “full” family incomes (wages, plus self-employment income, plus production for home consumption) in rural areas fell by only 21%, or about one-third of the decline in wages. They conclude (p.191) that: “Indonesian families have displayed a remarkable capacity for resilience in the face of the crisis.”

The urban households in Indonesia were not so fortunate. While urban wages fell by somewhat less than rural wages (55%), Smith et al. (2002) find that full family income in the urban areas fell by twice as much as in the rural areas (43% vs. 21% in rural areas) during the first year of the crisis. An important part of the rural households' ability to withstand the Indonesian crisis was due to the relative increase in the price of food, as well as farmers' ability to increase production in response to higher food prices. In fact, during this crisis, the agricultural sector showed a remarkable ability to absorb workers, with the farm labor force expanding by 20% (7.2 percentage points, when measured relative to the entire workforce) during the period of just one year.

Another important example of how partial equilibrium analysis has been used to address trade and poverty issues is Minot and Goletti (2000). They offer an in-depth examination of how rice market liberalization in Viet Nam would likely affect income and poverty in that country. They estimate household demand behavior and link this to a multi-market spatial equilibrium model of rice production and consumption. This enables simulations of (a) removal of the rice export quota, (b) changing the quota level, (c) replacing the quota with a tax, and (d) removing restrictions on the internal movement of food. The distributional consequences of these counterfactual policy simulations are determined by way of the net rice sales position of different household classes. Export liberalization is found to raise rice prices within the country, particularly in the country's rice exporting areas. The higher prices have a positive effect on rural incomes, and generally reduce the poverty headcount. Relaxing the restrictions on the internal movement of rice also generates net benefits for the country.

Since rice production is quite labor intensive in Viet Nam, a rise in rice prices should increase demand for agricultural labor, and consequently the agricultural wage rate. Higher rice prices would then lead to a greater decrease in poverty, particularly in households that derive a share of their income from agricultural labor. Unfortunately, Minot and Goletti's counterfactual analysis assumes that labor demand and wage rates remain constant. While they argue that landlessness and the use of hired labor are not widespread in Viet Nam, extending the model would show whether this modest role for hired labor would alter the results.

In a study of rural labor markets in Bangladesh, where hired labor is very important for many of the rural poor, Ravallion (1990) addresses analyses both the short- and long-run impacts of an increase in the price of rice on rural wages and poverty. He derives a simple condition which may be used to determine whether such households will gain from an increase in the price of rice. This requires that the elasticity of wages with respect to the price of rice exceeds the ratio of net food (rice) expenditures divided by net wage income. Based on his short and long run estimates of this wage elasticity, he concludes that the average landless poor household loses from an increase in the rice price in the short run (when the wage elasticity is relatively small), but gains in the long run (5 years or more) as the elasticity of wages, with respect to the price of rice, rises over time.

Porto (2003a, 2003b) offers a natural generalization of Ravallion's work for the case of Argentina. He estimates a set of wage equations for unskilled, semi-skilled and skilled labor, where the explanatory variables are tradable commodity prices, educational attainment and individual household characteristics. He then utilizes the resulting wage-price elasticities to estimate the impact on wages of potential changes in domestic commodity prices owing to trade reforms. In one paper, he provides an *ex post* analysis of the distributional impacts of MERCOSUR, concluding that it had a pro-poor bias (Porto, 2003b). By removing policies that favored the rich relatively more, MERCOSUR is estimated to have a favorable impact on the distribution of income in Argentina. In a separate paper, Porto (2003a) uses the same framework to conduct an *ex ante* assessment of prospective domestic and foreign trade policy reforms. In this case, he draws on outside estimates of the impact of foreign trade reforms on world prices. He concludes that foreign reforms are more important than domestic reforms when it comes to potential poverty alleviation.

Nicita (2003) uses the same approach as Porto to estimate how Mexican trade liberalization in the 1990's affected poverty. In addition, he accounts for differential price transmission from the border to different regions of the country. Nicita concludes from his *ex post* analysis that households gained from lower priced consumption goods, in the wake of trade reforms, but these gains were largely offset by reductions in unskilled wages and agricultural profits. With the poorest households hardest hit by these income losses, Nicita concludes that they gained much less than the rich. Therefore, the trade reforms are estimated to have increased income inequality.

The papers by Ravallion, Porto, and Nicita serve to further highlight the importance of labor earnings in determining the poverty impacts of trade policies, and so we now turn to studies in which these labor markets, as well as other factor markets, are explicitly modeled.

#### **IV. Determining Factor Market Impacts: General-Equilibrium Analysis**

If a researcher: (a) is interested in how trade liberalization will affect only a limited number of markets, (b) needs to incorporate extreme sector detail, or (c) has limited time available, then partial-equilibrium/cost-of-living analyses can offer a handy "rapid response" set of tools (Friedman and

Levinsohn, 2002).<sup>5</sup> They also have the advantage of being easier to understand than general equilibrium modeling. As seen above, partial-equilibrium/cost-of-living analysis often requires a researcher to abstract from the income side of the issue, or limit the analysis to consideration of a single factor (typically labor). The historical focus on commodity markets is due in part to lack of good data on household earnings, since in household surveys, income information tends to be less complete and less reliable than expenditure information (Cockburn, 2001; Lipton and Ravallion, 1995). However, as noted above, recent studies provide evidence that – regardless of the data limitations – this abstraction is not innocuous.

General equilibrium (GE) models, by contrast, can assess the impact of economic shocks that reverberate across sectors and, in some cases, regions of a country or the world. They are capable of producing disaggregated results at the microeconomic level, while providing a consistency check on macroeconomic accounts. GE models are typically benchmarked to a Social Accounting Matrix and based on neoclassical theories of firm and household behavior. While most are comparative static in nature, dynamic versions have also been developed, and a few of these will be discussed below in the section on economic growth.

One caveat with GE models is that they can become quite complex, thereby making it harder to distinguish the extent to which results are driven by particular modeling assumptions, or whether they are robust to model specification and largely data-driven. While this type of criticism can be leveled at almost any empirical modeling exercise, the fact is the work of GE modelers is very assumption-intensive, and they therefore bear a greater burden in ensuring that their results are robust to variation in these assumptions. Of course, the payoff from GE analysis is that it offers the prospect of being able to examine a wider range of issues that are critical for policy-making.

GE analysis of income distribution and poverty issues in developing countries has only recently become widespread. However, its origins go back fairly far -- to the pioneering work of Adelman and Robinson for Korea (1978) and Lysy and Taylor for Brazil (1980). In addition, Bourguignon led an important series of studies on the topic of macro-economic adjustment and

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<sup>5</sup> Of course to conduct *ex ante* analysis of policy reforms, this approach must still be combined with a simulation model with which to generate prospective price changes.

income distribution in the early 1990's (Bourguignon and Morrison, 1989, 1992; Bourguignon, de Melo, and Morrison, 1991; Bourguignon, de Melo, and Suwa, 1991).

Of the more recent studies, Löfgren (2000) is representative of the way many applied GE models are currently used to analyze trade and poverty issues.<sup>6</sup> Löfgren investigates how reduced agricultural and industrial protection affect representative Moroccan households in the short run. The general equilibrium model is calibrated to a 1994 Social Accounting Matrix that captures the pronounced rural/urban disparity in economic structure, wages, and education that is characteristic of Morocco. Four household groups are distinguished according to whether they are rural or urban, poor or non-poor. The model relies on standard neoclassical assumptions and is set up in “real” terms, meaning there are no asset markets, money is neutral, and all agents make decisions as a function of relative prices. Löfgren's simulations assess the impact of removing border protection under different assumptions about labor market rigidity. Domestic trade liberalization in agriculture is found to produce gains for the country as a whole, while the rural poor lose out. Investments in rural education and infrastructure, plus government transfer payments are necessary if rural households are to benefit from liberalization.

On the methodological side, Löfgren finds his results to be strongly influenced by the commodity, factor, foreign exchange, and government budget links between agriculture and the rest of the economy (these correspond to links (a), (b), (c), and (e) listed in section II above). Of the potential linkages, Löfgren excludes only the investment and innovation link (d), and the risk and adjustment cost link (f). Ignoring these two effects likely results in systematic underestimation of the long-run *benefits* and short-run *costs* of trade liberalization, respectively. However, determining the ultimate importance of these two linkages requires specification of a stochastic, dynamic model, which is beyond the scope of this study.

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<sup>6</sup> Some of the other studies in this general category are: Devarajan and van der Mensbrugghe (2000); Sadoulet and de Janvry (1992); Dorosh and Sahn (2000); Coxhead and Warr (1995); Bautista and Thomas (1997); Harrison, Rutherford, and Tarr (2003); Levin (2000); and Cockburn (2001). Summaries are provided in the tables of Reimer (2002). See also Löfgren, Robinson, and El-Said (2003) for a brief introduction to this topic. Cloutier, Cockburn, and Decaluwé (2004) provide an extensive modeling survey of CGE analysis of poverty and trade liberalization.



Löfgren's general approach is fairly representative of a large number of trade and poverty studies carried out over the past decade. One variant is to address in greater detail how external shocks affect the *total* income distribution of a country. For this purpose it is necessary to postulate a distribution of income for each representative household type (as in Adelman and Robinson) or to work at the level of individual workers (as in Cogneau and Robilliard, and Cockburn). If the distribution of income within a given group of households is estimated *a priori*, it can be used in conjunction with the general equilibrium model to assess the impact of exogenous shocks on income distribution and poverty. In these studies, it is typically the case that mean and total income levels for a household group are endogenous, while higher moments of the distribution are fixed.

In an interesting and useful synthesis paper, Decaluwé, Patry, Savard, and Thorbecke (1999) consider this basic approach and provide further refinements. One innovation is to model the within-group income distribution with a flexible Beta distribution instead of the restrictive log-normal or Pareto distributions that are commonly used. This permits them to adapt the shape of the income distribution to observed socio-economic characteristics of each household type, and it is shown that these distributions vary markedly across household groups. In turn, an endogenous poverty line is developed based on the cost of obtaining a subsistence level of consumption. Although no empirical results are presented, these innovations are ripe for use in conjunction with the new, increasingly detailed household-level data becoming available, and thus could shed additional light on the behavior of poverty following an external shock to the economy.

Cogneau and Robilliard (2000) offer a fundamentally different approach to trade, poverty, and income distribution modeling. They assess the impact of different growth strategies on poverty in Madagascar by embedding an econometrically estimated labor allocation model based on 4,508 households *within* a general equilibrium framework.<sup>7</sup> The combination of micro-simulation and general equilibrium facilitates the modeling of a country's overall income distribution, since it is no longer necessary to *a priori* assume an income distribution for each household type. In addition, the

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<sup>7</sup> Two other studies that incorporate large numbers of actual households into a relatively standard GE model are Gørtz, Harrison, Nielsen, and Rutherford (2000), and Rutherford, Tarr, and Shepotylo (2003). The latter study works with more than 50,000 households in a CGE model of Russia.

representative household assumption and its associated theoretical shortcomings are dropped almost entirely. However, these accomplishments entail higher data requirements and computational costs, and may require other dimensions of the model to be scaled back (e.g., the authors are only able to consider three sectors and four commodities).

Cogneau and Robilliard analyze a variety of sector-level shocks to Madagascar's economy including, among others, shocks to the world price of cash crops. Without exception, they find that the impact of poverty and inequality is small. They give three reasons for this. Firstly, they argue that many of the households are diversified in their sources of income and so the impact of sector-specific shocks are muted. Secondly, to the extent that households are not initially diversified, they may respond to the external shock by changing their allocation of labor, in an effort to equate factor returns across sectors, thereby spreading the impact beyond the directly affected sector. Finally, they make the point that the second-round benefits of any favorable development tend to accrue to those individuals who control the factors of production in the economy. Thus a disproportionate share of the gains go to the wealthy, preserving the initial degree of inequality. This stability of the overall income distribution in the face of policy interventions has long been observed by those working in this field (e.g., Dervis, de Melo and Robinson, 1982).<sup>8</sup>

## **V. Micro-Macro Syntheses**

While the approach of Cogneau and Robilliard is innovative and ambitious, it remains beyond the reach of most CGE modelers seeking to obtain some basic insights into the links between trade and poverty. This is particularly true in larger countries, where much greater sector detail is required, and where survey data may involve well in excess of 100,000 households. It is also complicated by the fact that researchers with expertise in CGE modeling are typically different from those with expertise in household modeling. As a result, it can be difficult to satisfactorily integrate the two frameworks into one grand model.

Therefore, we turn next to a series of studies that aim to capitalize on detailed household survey data, while retaining more manageable general equilibrium models. For lack of a better term, we label this category “micro-macro synthesis.” An alternative description might be “general

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<sup>8</sup> Of course, this is still just a sample of *all* the households in a population.

equilibrium simulation with post-simulation analysis of household impacts.” This approach is best characterized by its two-step nature, whereby the general equilibrium model is first simulated to get commodity and factor price changes. These are then fed into a micro-simulation framework that calculates the effects on individual, or highly disaggregated representative households. Various poverty measures can be applied to assess the distributional effects of shocks.<sup>9</sup>

An obvious limitation of post-simulation analysis, at least in the view of general equilibrium practitioners, is that the reactions of households to commodity and factor price changes in the post-simulation analysis are not transmitted back to the general equilibrium model. Although this absence of feedback is not satisfactory from a theoretical point of view, the resulting measurement error is likely to be small. This is due to the fact that: (a) spending patterns tend to be a function of household income per capita, so the transfer of income between two households with similar income levels (e.g., rural non-farm labor and agricultural labor) has little effect on aggregate demand, and (b) the change in spending patterns as households become wealthier is a gradual one, and the change in the overall income *distribution* stemming from trade policy changes is also modest (recall the results from Cogneau and Robilliard above). Therefore, the change in aggregate demand due to changes in the distribution of income across strata and across income levels is likely to be very small. So ignoring the impact of such changes on equilibrium prices is most likely not very damaging.<sup>10</sup>

The simplest micro-macro syntheses are really just an extension of the partial equilibrium, cost-of-living studies to include a full vector of commodity prices as well as factor prices. Chen and Ravallion’s (2003) study of the poverty implications of China’s WTO accession offers a good example of this approach. In this work, the authors combine disaggregated household survey data with trade

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<sup>9</sup> A few studies in this general category are: Robilliard, Bourguignon, and Robinson (2003); Ianchovichina, Nicita, and Soloaga (2001); Hertel, Ivanic, Preckel, and Cranfield (2004); and Friedman (2001). Summaries are provided in the tables of Reimer (2002).

<sup>10</sup> Informal discussions with authors working in this area confirm this fact. Both Thomas Rutherford and Maros Ivanic report that equilibrium results obtained with a single aggregate household differ little from those obtained with CGE models which disaggregate a large number of households.

liberalization results from the Global Trade Analysis Project (GTAP) model of global trade. They assume that households are currently maximizing utility subject to their budget constraint and this permits them to infer the change in household welfare associated with marginal price changes by multiplying these price changes by the households' budget shares – taking into account net sales by the household as well (including sales of labor and capital services). Since this calculation is computationally simple, they do so for the entire household survey, and draw conclusions about the likely impacts of accession by individual household type and location.

One of the main findings in the work of Chen and Ravallion, as well as the subsequent work of Ravallion and Lokshin (2004) on Moroccan trade policy, is the heterogeneity of effects across different types of households with the same pre-reform level of welfare. They refer to this as “horizontal inequality.” In their Morocco paper, Ravallion and Lokshin (2004) find that, depending on the depth of cuts in cereals protection, the impact on aggregate inequality can be fully explained by the horizontal component. Specifically, they conclude that for small cuts in protection – on the order of 10% – there is an increase in inequality that is largely fueled by the benefits flowing disproportionately to the wealthy (vertical inequality). However, in the case of full liberalization in the grains markets, they find the opposite to be the case; horizontal inequality dominates. That is, the predominate impact of trade liberalization on inequality is through the differential impact on households with the same level of pre-reform income.

The potential for generating highly disaggregate policy impacts is a great advantage of the Ravallion *et al.* approach. However, like the cost-of-living approach, this abstracts from the second-order impact that price changes might have on the households' mix of consumption and earnings. While households are unlikely to radically change their consumption patterns in the wake of a modest change in relative prices, this is not necessarily the case with sales revenue. While a farm household might reduce its consumption of maize slightly in response to a 10% increase in price, it might shift *completely* from producing and selling oilseeds to growing maize. In the latter case, the welfare predictions made based on a first-order approximation might be rather misleading. Consider the case where a farm household in poverty has a choice between producing two commodities: maize or wheat. Initially they specialize in wheat, but WTO accession lowers the price of wheat, boosting that of maize. So they switch all of their land to maize production. The welfare approximation based on the

initial (wheat) sales earnings shares suggests that they will lose from WTO accession, whereas, after adjustment (to maize), they may end up boosting their income, possibly even lifting them out of poverty.

Robilliard, Bourguignon, and Robinson (RBR, 2003) sacrifice some of the detail attained by Ravallion *et al.*, but dig more deeply into the households' labor market responses to external shocks. Their work highlights a different set of benefits of the two-step, micro-macro approach to poverty analysis. As in the Friedman/Levinsohn paper, the authors study the effects of the 1997 Indonesian crisis on poor households. The methodology here, however, involves linking the output of a GE model with post-simulation analysis based on a micro-simulation model. The micro-simulation model is estimated with a 33,000 person sub-sample of the 1996 Susenas survey, and offers a detailed representation of the way households generate their income.<sup>12</sup> Earnings and occupational choice equations are a function of personal characteristics, so when there is a decline in the aggregate demand for wage labor, the model predicts which individuals are forced into the informal sector. Such a shift can mean a dramatic decline in income for an individual, and indeed the entire household. Capturing this phenomenon is the real strength of the RBR micro-simulation model.

The RBR GE model relies on standard neoclassical assumptions and is linked to the micro-simulation model through (a) the wage rate in each labor market, (b) income per worker in the informal, self-employed sector, (c) the number of wage workers and self-employed workers, by labor market segment, and (d) consumption prices. The micro-simulation model is solved to generate values for these linking variables that are consistent with the general equilibrium model.

The authors validate their model against the historical facts via two steps. First, they set aside the CGE model and simply impose observed historical changes in the linking variables that drive the micro-simulation model. They then compare the changes in poverty produced by the latter to changes actually observed over the crisis period. Results indicate the model captures the qualitative flavor of the impacts across population segments, but over-predicts the total increase in poverty (+239% estimated vs. +67% observed in the poverty headcount).

Second, they add the CGE component, which permits them to relate the poverty changes to the underlying factors driving this crisis, including the: foreign credit crunch, domestic credit crunch, real devaluation, and El Nino drought. They find that the financial crisis did indeed contribute the majority

of the poverty increase, but the impact of El Nino was also quite significant. This is a more nuanced perspective than that offered by Friedman and Levinsohn (see above) who implicitly attribute all of the changes to the financial crisis. On the methodological side, the RBR approach is much costlier, since the unit of analysis is an individual household, and the micro-simulation model must first be econometrically estimated. Presumably this is why, unlike Ravallion *et al.*, the full survey is not used.

In a follow up paper, Bourguignon, Robilliard and Robinson (2003) compare an analysis based on the RBR model to that obtained using representative household groups (RHGs). The latter are simply the ten household groups identified in the CGE model (4 agriculture, 3 rural non-agriculture, and 3 urban non-agriculture). The distribution of income within each of these groups is assumed to be fixed, so all households get the same percentage increase or decrease.

The authors compare results from the micro-simulation and RHG approaches for a variety of macro-economic shocks. They find the representative household approach systematically *underestimates* the effect of the shocks on income inequality and poverty. Of course, this underestimation is with respect to the predictions based on the micro-simulation model. But the paper by RBR (2003) shows that the micro-simulation model tends to *overestimate* the actual change in poverty in the wake of the financial crisis. Understanding how well the RHG approach does with respect to the historical record would require a further comparison which is not offered in the work of these authors to date. Nevertheless, we find their comparison of the RHG and micro-simulation approaches compelling; it suggests that the simplicity of the RHG approach may come at a high cost.

In closely related work, Bussolo and Lay (2003) apply the RBR modeling approach to Colombia, in an effort to understand the impact of the 1990s tariff cuts on poverty. They find that the subsequent rise in unskilled wages as well as the movement of workers from the informal to (higher wage) formal sector employment in rural areas leads to a substantial reduction in rural poverty. They attribute more than half of the national poverty reduction over the 1988-1995 period to the tariff reforms. As with the Indonesia study, Bussolo and Lay compare their findings for Colombia to those obtained using a RHG modeling approach. They find that the RHG approach overestimates urban poverty reduction, while underestimating rural poverty reduction. So one cannot determine *a priori* the nature of the bias introduced by the RHG approach.

A middle ground between individual household modeling and the RHG approach is offered by Hertel, Ivanic, Preckel, and Cranfield (2004). Their approach is geared towards shedding light on the impacts of global trade liberalization across a wide range of developing countries. This multi-country approach is inevitably less detailed for any given country, which is why they seek a middle ground between the full complexity of household-level micro-simulation, and the RHG approach.

These authors begin by stratifying households into seven groups, based on earnings specialization. They identify households that receive 95% or more of income from agricultural self-employment, non-agricultural self-employment, wage labor (rural vs. urban) and transfer payments.<sup>11</sup> All other households are considered diversified, and are broken into rural and urban groups. Up to this point, this sounds like the RHG approach, but within each of the seven strata the authors aggregate the survey data into twenty vingtiles, based on initial income per capita. This results in 140 distinct households per country, and permits them to analyze changes in income distribution *within* strata, as well as *between* strata.

The authors estimate a common demand system for all households and use this to characterize consumption behavior as well as establishing a poverty level of utility. The micro-simulation model in each country consists of each of the 140 households maximizing utility subject to a budget constraint determined by their endowments and the commodity and factor prices obtained from the CGE model. They explore two different factor market closures, the first (limited factor mobility) is one in which only wage labor is mobile across sectors, and the second (full factor mobility) is one in which self-employed labor and capital are also mobile. (Agricultural land is sector-specific in both cases.) In their analysis of the Indonesian poverty impacts of multilateral trade liberalization, the authors find that in the short run (limited factor mobility), the *between stratum* earnings differences dominate, while the limited *within stratum* differences derive mainly from consumption effects.

More specifically, Hertel et al. (2004b) find that multilateral trade liberalization boosts food prices, relative to non-food prices in Indonesia. This hurts the poor within each stratum more than the rich, since the poor spend a much larger share of their income on food products. On the earnings side, wages rise, particularly for unskilled workers. So, in the short run, with limited factor mobility,

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<sup>11</sup> Sensitivity analysis by the authors indicates that the classification of households is robust to variation in the cut-off point between 90% and 99% specialization.

poverty falls in the wage labor strata as well as for diversified households. However, agricultural profits fall, since producer costs rise faster than revenues. Thus agricultural poverty rises slightly in the short run. In the terminology of Ravallion and Lokshin (2004), horizontal impacts seem to dominate the vertical ones when inter-sectoral factor mobility is limited.

In the full mobility factor market closure, the *within stratum* earnings differences are much greater. Now, the welfare of the low-income self-employed workers hinges largely on changes in unskilled wages, regardless of their sector of employment, while the fate of the wealthy households depends on skilled wages and returns to capital and land. (In this “long run” factor market closure, agricultural land absorbs the reduction in agricultural profits.) With unskilled wages rising, this results in very similar rates of poverty reduction across all strata. So with full factor mobility, the horizontal inequality tends to be eliminated, while vertical inequality is exacerbated. This is a hypothesis that warrants further examination for other countries and other types of trade reforms. As with the Bourguignon et al. (2003) study, this work also highlights a limitation of those studies that simply assume a common income shift for all households within a given “representative group.”

## **VI. Estimating the Linkages between Trade, Growth and Poverty**

In the long run, there is little doubt that the only way to obtain large reductions in poverty is through economic growth. Thus, in the context of any discussion of trade and poverty, it is natural to look for a linkage between trade liberalization and growth, which in turn might give rise to a long run reduction in poverty rates (see also Winters et al., 2004, for an extensive discussion of the trade-growth-poverty linkage). In the last ten years, much has been written on the connection between trade and growth – both from a theoretical and an empirical perspective. The empirical work has largely relied on cross-country regression analysis, as exemplified by Dollar and Kraay’s (2001) paper on the poverty impacts of trade liberalization.

These authors first categorize developing countries as either globalizers or non-globalizers based on changes in trade volumes and tariff rates since 1980. They then carry out case study as well as statistical analysis. Looking at anecdotal evidence on poverty, including time-series Gini coefficients and income growth rates for average households versus the poorest quintile, they find no general trend in inequality among countries classified as globalizers. Globalizers, however, tend to



have higher rates of growth than non-globalizers. This leads to the conclusion that globalization tends to be associated with a decline in absolute poverty. Verifying these findings in a more rigorous manner, the authors undertake cross-country regression analysis, and determine that no systematic relationship exists between changes in trade volumes and changes in the income share of the poorest. Additionally, no statistical relationship between changes in trade volumes and changes in income inequality is found.

Rodrik (2000) offers a cogent critique of the Dollar-Kraay study, and also highlights the controversy surrounding cross-country regression research more generally. His remarks relate to issues with the data, to the difficulty of distinguishing between correlation and causation in cross-country regression analysis, and to the challenge of obtaining results that are robust to specification changes. Estimating the relationships that exist between trade policy, growth, and poverty depends critically on finding appropriate measures of these variables, and carefully sorting out omitted variable and endogeneity problems, all of which are quite challenging given the very limited data available.

In his recent book on trade and poverty, Cline (2004) combines the econometrically estimated elasticities of growth with respect to trade, as well as country-specific elasticities of poverty with respect to growth, with a CGE analysis of global trade liberalization. This permits him to synthesize an estimate of the aggregate, long run poverty reduction that might arise from such a policy change. He begins with the global CGE model of Harrison, Rutherford, and Tarr (1997), augmenting the usual static gains from trade with “steady-state” quasi-dynamic gains that follow in the long run from increased investment.

To this, he adds another pure productivity effect which he infers by multiplying the increase in trade for each region – as estimated by the CGE model – by a “central estimate” of the elasticity of output with respect to trade. (The latter is distilled from a review of the now vast cross-country growth regression literature.) Having obtained an estimate of long run growth in per capita income resulting from trade reform, Cline then applies a country-specific “poverty elasticity” with respect to growth, based on an assumed log-normal income distribution for each region, in order to obtain his final estimate for poverty reduction. His estimates are large, totaling nearly 650 million people – the bulk of these in Asia – where the absolute number of poor (based on a \$2/day metric) is large, and trade growth is relatively high following multilateral trade liberalization.

Cline's growth-based estimates of poverty reductions stemming from trade liberalization are considerably larger than those obtained by the World Bank Development Prospects Group (DPG), 2004. These authors use a recursively dynamic, CGE model to estimate the poverty reduction in 2015, owing to gradual global trade liberalization between 2005 and 2010. Unlike Cline, they actually track the accumulation of capital in response to increased investment, and the openness/productivity multiplier is also an explicit part of their model. Like Cline, they use a poverty elasticity with respect to aggregate income to convert economic growth into poverty reduction. However, the DPG study uses a uniform poverty elasticity of 2.0. In contrast, Cline uses estimates ranging from 1.0 to 3.5, with those for most of the Asian region, including India and China, at the top of this range (3.5). Overall, Cline's elasticities, which are based on a simple formula and are a function of each country's Gini coefficient and the ratio of mean income to poverty income, appear to be larger for the most populous countries in the developing world. Taken together with the more modest rate of capital accumulation due to the absence of Cline's steady-state assumption, this helps to explain why the DPG study concludes that such trade reforms would reduce \$2/day poverty by 320 million – roughly half of Cline's estimate.

Cline's synthetic estimates – as well as those from DPG – highlight the potential for trade liberalization to have a substantial long run impact on poverty. However, in order to get to this estimate, he must follow a long and arduous path, crossing several research “minefields” in the process: “steady-state” CGE analysis, growth theory, and cross-country regression analysis, in addition to the responsiveness of poverty to economic growth. It will be some time before these individual pieces are strong enough to support anything more than back-of-the-envelope estimates of potential long run poverty impacts of trade reform. In the meantime, we expect that most of this literature will continue to emphasize the short- to medium-run income distributional impacts of trade reform on poverty resulting from comparative static estimates of the ensuing commodity and factor price changes. To the extent that most policymakers focus on this shorter time frame, and because short run impacts are especially important for households facing extreme poverty, we believe this emphasis is justified. With this in mind, we turn next to a potential research agenda that emphasizes the short- to medium run impacts of trade liberalization on poverty.

## VII. Directions for Future Research

***Missing Markets and Factor Mobility:*** When some markets do not exist, or when transactions costs are high enough to preclude household participation in these markets, the implications go well beyond the missing market itself. In their paper on the role of market failure in peasant agriculture, de Janvry, Fafchamps, and Sadoulet (1991) show that missing markets for labor and/or staple foods, serve to substantially dampen the supply response of peasant households to changes in cash crop prices. This line of reasoning, coupled with the prevalence of subsistence producers in Mexico in the early 1990's, led de Janvry, Sadoulet, and de Anda (1995) to conclude that the majority of the maize producers in the *ejido* sector would be little affected by the grains price declines expected to arise under the North American Free Trade Agreement (NAFTA). As a consequence, their estimates of the overall reduction in maize production were considerably smaller than those generated by aggregate CGE models (e.g., Robinson et al., 1993).

In fact, maize production in Mexico has not fallen at all in the wake of these price declines, and Taylor attempts to explain this phenomenon using a village-level CGE analysis (Taylor et al., 2003). Taylor argues it is subsistence producers, who have expanded cultivated area, that have bolstered maize production in the wake of the price drops. He emphasizes the role of local labor and land markets in redistributing land away from the large commercial producers towards smaller subsistence farmers. In particular, while wages received for working on commercial farms have fallen, land rents have also dropped, leaving a strong incentive for subsistence producers to take on more land and increase the hours devoted to self-employment in farming.

Since the main endowment of the poor is their own labor, the market that deserves greatest attention by those studying trade and poverty is clearly the labor market. And assessing how well the labor market in a given economy functions becomes a central empirical question. Fortunately, there is an emerging body of literature aimed at testing for market failure – or as the issue is often framed: testing for the *separation* of household and firm decisions. If the labor market is functioning effectively, the amount of labor used on a farm should depend only on the wage rate and not on the number of working age individuals in the farm household (separation applies).

Benjamin (1992) provides an excellent example of how to test the separation hypothesis. He does so, in the context of rice production in Indonesia, by incorporating demographic variables in the

farm firm's labor demand equation and testing for the significance of the associated coefficient. Interestingly, he fails to reject the separation hypothesis, meaning that markets appear to be working. However, the lack of wage labor income among many of the poorest rural households in some of the poorest countries suggests that this hypothesis might well be rejected in other cases. Hertel et al. (2004b) note that nearly 40% of the households in the poorest developing countries are completely specialized in farm income. These households are also disproportionately poor. Therefore, further examination of the separation hypothesis appears to be warranted.

This brings us to the more general question of labor mobility – both across sectors and between the formal and informal (self-employed) sectors of the economy. Hertel et al. (2004b) emphasize this point in their analysis of factor market closure and its implications for the impacts of trade liberalization on poverty. If self-employed workers and physical capital are immobile across sectors, then the pattern of poverty impacts that arises following trade liberalization is quite heterogeneous, since trade reforms invariably hurt some sectors (e.g., manufacturing) at the expense of others (e.g., agriculture). However, with self-employed labor and capital mobile between agriculture and non-agriculture, they find a much more uniform pattern of poverty reduction, with real unskilled wages the driving force behind these changes.

Which specification is correct? This will surely vary by country, and it calls for additional econometric analysis – although this time at the level of markets, as opposed to households. Recent econometric evidence from rural China suggests that the degree of off-farm labor mobility is quite low, particularly for households with low educational attainment (Sicular and Zhao, 2002). Hertel, Zhai, and Wang (2004) find that off-farm mobility is the key determinant of whether poverty amongst agricultural households is reduced following China's accession to the WTO. At higher levels of off-farm mobility, the boost in unskilled manufacturing wages is transmitted back to the farm, and lifts the welfare of low-income households, despite lower farm prices.

A rather different view of the relationship between the formal and informal sectors is offered by Robilliard, Bourguignon, and Robinson (2003). They assume that the informal sector is the residual claimant for surplus labor, with rigid formal sector wages limiting the amount of adjustment that occurs in that labor market. As a result, they obtain very strong poverty impacts in Indonesia, when they analyze the Asian financial crisis. They model this crisis as squeezing the formal sector

particularly hard, due to its reliance on foreign working capital and imported intermediate inputs. As the formal sector contracts, it sheds workers to the informal sector, and these individuals experience a sharp drop in wages. In fact, it appears this effect is overly strong, as the authors find that their micro-simulation model overstates the poverty increase following the Asian crisis by a considerable margin when they conduct an historical simulation. This suggests the need for a better understanding of the wage gap between these two sectors, and what determines the movement in and out of formal sector employment.

***Characterizing Consumption Behavior:*** There is considerable variation in the approaches researchers have taken to characterizing consumer behavior in their analyses of trade and poverty. The general equilibrium assessments all involve the specification of a utility or expenditure function which characterizes preferences globally (not just locally). These demand systems are usually “calibrated” so that preferences vary by household. For example, in their study of poverty in Brazil, Harrison, Rutherford, Tarr, and Gurgel (2003), calibrate Cobb Douglas preferences to each of ten rural and ten urban households. Since the expenditure patterns differ across all these households, so too do the preferences. Since this demand system holds consumer expenditure shares constant, it is essentially equivalent to the approach of Chen and Ravallion, from a spending point of view.

Decaluwé et al. (1999) take a slightly different approach, by identifying a subsistence level of consumption that is associated with the poverty line in a particular developing country. They utilize the more general, Linear Expenditure System (LES), which permits them to incorporate the subsistence quantities directly into the household demand structure. The other parameters must be calibrated for each different household group. This gives them an endogenous poverty line, which is a determined by the inner product of the subsistence quantities and prices.

Hertel et al. (2004b) utilize a generalization of the LES demand system, AIDADS, which has been shown to perform well in predicting expenditure patterns across the income spectrum (Cranfield et al., 2002). They estimate this demand system using a combination of international cross-section data and household survey data from individual countries. The estimated demand system is then adjusted (calibrated) to exactly replicate the distribution of total expenditure and per capita spending by commodity in each individual country before proceeding with the policy analysis. The authors then proceed to use this demand system to predict the consumption impacts across households at different

income levels. This is a very different approach from those discussed in the preceding paragraphs. The household survey data are used in the estimation process, but they are not used in the simulation model itself.

This has several advantages. Firstly, since all households in a given country have the same preferences, there is also a well-defined poverty level of welfare, and the analysis of consumption impacts is clean and straightforward. Secondly, to the extent there are measurement errors in the household survey, these will likely be eliminated in the process of estimation of the demand system. Finally, it permits the authors to adjust predicted consumption levels in cases where the household survey data and CGE model refer to different base periods. On the other hand, one important drawback of this econometric approach to assessing the consumption impacts of trade reform is that one can no longer refer to the impacts on particular households in the survey.<sup>12</sup>

**Transactions Costs:** In their survey of the empirical evidence on trade liberalization, Winters, McCulloch, and McKay (2004) highlight the important role of transactions costs between the border and the consumer (for imports), and between the border and the producer (for exports). Assuming these marketing costs are specific (as opposed to *ad valorem*), they tend to dampen the impact of world commodity price changes on domestic consumers, while exaggerating the impact of such price changes on producers of export products. As a result, the presence of such marketing costs can sharply alter the predicted impact of trade policy changes on remote rural households.

Recent work by Arndt et al. (2000) in Mozambique underscores the empirical significance of marketing margins in low-income countries. The authors report producer-consumer margins as high as 300% (cassava). The biggest margins reported in their study appear to be for food products, which tend to dominate both the consumption and production bundles of the poor in that country. So the existence and behavior of these margins is critically important for any poverty study.

The only study in this survey to seriously come to grips with this issue is that of Nicita (2003), who estimates a modified version of the popular exchange rate pass-through model (e.g., Goldberg and Knetter, 1997). This model offers differential pass-through of Mexican tariff changes, by region,

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<sup>12</sup> Furthermore, this approach needs to be more extensively validated. While the authors have found that it does a good job of predicting expenditure patterns by commodity across the income spectrum in Indonesia, more work is required to ensure that its predictive performance is satisfactory across a range of developing countries.

based on a measure of distance from the United States, which the author argues is the primary source of most imports. In keeping with most of this literature, he finds incomplete pass-through of the tariff changes to consumers in Mexico, with the extent of pass-through being smaller for agriculture than for manufactured goods. When coupled with a rapid erosion of pass-through with increasing distance from the border, this means that agricultural tariff cuts have little or no impact on the more remote regions of Mexico. Nicita argues that this low pass-through for agricultural products is due to the fact that transportation costs are high, and these products face more competition from domestic sources so that local production quickly becomes more profitable as one moves away from the border. Indeed, he notes: “domestic supply is likely to set the price of certain agricultural products regardless of border measures” (p. 23). This type of assessment sharply alters our view of the impact of trade liberalization on rural households, and much more work on the problem of price transmission is needed.

**Data Reconciliation:** The proper treatment of marketing margins is also important when one seeks to reconcile household survey data with the national accounts upon which CGE models are based. Expenditures in the survey are reported at consumer prices, while most CGE models measure consumer demand at producer prices. In order to bridge the two, one needs a producer-consumer transition matrix (e.g., Ballard et al., 1985). Of the studies referred to above, only the one by Hertel et al. (2004b) explicitly models this wholesale/retail/transport margin.<sup>13</sup> In most studies, the two data sets are either allowed to diverge, or they are forced to balance by making arbitrary adjustments on both sides. This can give rise to misleading inferences about the incidence of commodity price changes on the poor, in particular, for the same reasons mentioned above.

Data reconciliation between household surveys and national accounts is also required on the income side (Robilliard and Robinson, 2003). Indeed, due to under-sampling of wealthy households, and under-reporting of income, it is not uncommon for total income reported in a household survey to be less than half that reported in the national accounts. In addition, the under sampling/reporting problem tends to be more severe for capital, as opposed to labor, and for non-farm activities as opposed to agriculture (Ivanic, 2004). Thus a failure to correct for this problem can result in two very different looking economies, depending on whether one uses the survey or national accounts data. Consequently, estimates based on the household survey data will tend to be excessively intensive in

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<sup>13</sup> Chen and Ravallion take an exogenous margin into account when computing their consumer prices.

labor and agricultural value-added. This can give rise to misleading inferences, when one aggregates the household results up to the national level.

An example of this problem arises in two recent studies of the poverty impact of China's WTO accession. The first is a global CGE analysis in which final demand in China is modeled via a single representative consumer (Ianchovichina and Martin, 2003). They find that China as a whole gains from accession. However, those authors are unable to speak to the poverty issue. Towards this end, a second study (Chen and Ravallion, 2003) takes the price changes from the global CGE study and applies them at the individual household level to elicit the distributional consequences of accession using full detail in the household survey. Thus the authors are able to identify which types of households in which provinces and with which demographics lose and which gain. This is extremely useful information.

However, when the individual household impacts are aggregated up to the national level, China is found to lose, not gain, from WTO accession, thereby contradicting the original macro results from which the household impacts are driven. It is easy to see why this might be the case. Agriculture is hurt most by WTO accession and if this portion of national income is overstated in the survey, then it will take on disproportionate importance in the estimated national impacts – thereby giving the misleading impression of an overall loss. Such contradictions are pervasive in the so-called micro-macro synthesis literature, and this highlights the need to reconcile the underlying data bases before undertaking serious policy analysis (Ivanic, 2004).

***Tax Revenue and Transfer Payments:*** Trade taxes are an important part of total revenue in many developing countries and so the fiscal implications of their reduction or elimination under various trade reform scenarios needs to be given serious consideration (Harrison, Rutherford, and Tarr, 2000). Depending on the choice of tax replacement instrument, the poor may be adversely affected. For example, value-added taxes are a common alternative to tariffs as a revenue-raising instrument. Since the poor have a low propensity to consume imported goods, but a very high average propensity to consume out of current income, this switch may well have an adverse effect on poverty.

Of course, one alternative to tax replacement involves a reduction in government spending. Given the heavy reliance of the poor in many countries on public transfer payments, reductions in this area of the budget could also have adverse consequences for poverty. In general the determinants of



transfer payments, both domestic and overseas remittances, in most analyses of trade and poverty are not well fleshed out and deserve greater attention in the future.

## **VIII. Conclusions**

One of the most lively areas of development economics research in recent years involves assessing the micro-economic implications of macro-level policies – particularly those related to international trade. The 2003 volume edited by Bourguignon and Pereira da Silva sets out the current range of tools available for evaluating the poverty impacts of economic policies. These editors conclude that, while there is a wide range of research methodologies available for assessing the micro-economic incidence of micro-policies, and similarly many tools for assessing the impact of macro-level policies on markets and broad groups of “representative” households, there is a gap in the current literature when it comes to eliciting the disaggregated household and firm level impacts of trade and other macro-economic policies. Recent research aims to address this gap in our knowledge and the present survey offers an overview of this literature.

Many of the most recent and innovative studies sequentially link the top-down and bottom-up approaches in a two-step procedure, such that general equilibrium mechanisms are incorporated along with detailed household survey information. While not necessarily elegant in a theoretical sense, this approach accounts for the majority of trade-poverty linkages, is based on solid empirical foundations, and is compatible with both single and multi-region trade modeling. With time, we expect the degree of integration between micro- and macro-analyses to become tighter, with fully integrated general equilibrium models eventually becoming the norm at both the national and global levels.

This review highlights the critical role of factor markets in determining the poverty impacts of trade policies. The preponderance of the evidence from the studies encompassed by this survey points to the dominance on earnings-side impacts over consumption side effects. This is problematic, since household surveys are notable for their under-reporting of income. From the perspective of the poor, it is the market for unskilled labor that is most important. The poverty impacts of trade policy often hinge crucially on how well the increased demand for labor in one part of the economy is transmitted to the rest of the economy via increased wages, increased employment or both. Further econometric research aimed at discriminating between competing factor mobility hypotheses is urgently needed.

In many developing economies, there exist substantial wage differentials between the formal and informal sectors, and the loss of a high wage job can be sufficient to plunge the entire household into poverty. A few of the most recent studies have attempted to predict not only how many jobs will be lost (or gained) in the formal sector as a result of a trade policy shock, but also which individuals are most likely to lose their job. This level of resolution represents the ultimate goal of the literature in this area, but much more work will be required before such predictions can be made with confidence.

Other research issues needing immediate attention include: (a) the treatment of marketing costs and the associated transmission of border price changes to rural producers and consumers; evidence indicates that limited price transmission can severely limit the gains to the poor from trade reforms; (b) reconciliation of household survey and national accounts data; in the absence of such reconciliation the micro- and macro-predictions can be wildly inconsistent; and (c) the appropriate characterization of consumption behavior. In the longer run, research on trade/poverty linkages will also benefit greatly from independent advances in the literature characterizing the links between trade, trade policy, and economic growth. The latter is the only proven means of obtaining significant long-run reductions in global poverty.

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